Indoor Air Quality Update

June 27, 2013

California Environmental Protection Agency

Air Resources Board

ARB's Indoor Air Quality Program

- Indoor air quality reflects outdoor and indoor air pollution sources
- Improving outdoor air quality reduces indoor pollution
- Indoor sources alone can cause poor indoor air quality
- ARB's Indoor Program includes research and mitigation

Indoor Air Quality Authority

- No federal or State agency has full authority
  - Several agencies have some authority
- ARB's indoor air quality authority
  - Ozone from indoor air cleaners
  - Use Toxic Air Contaminant Program authority
  - Consumer Products Program
    - Focus is on outdoor air quality standards
    - Benefits to indoor air quality

Indoor Program Research: Focus on Children, Homes and Schools

1980s

Activity Patterns, Indoor Toxics

1990s

Children's Exposures, Formaldehyde Emissions

2000

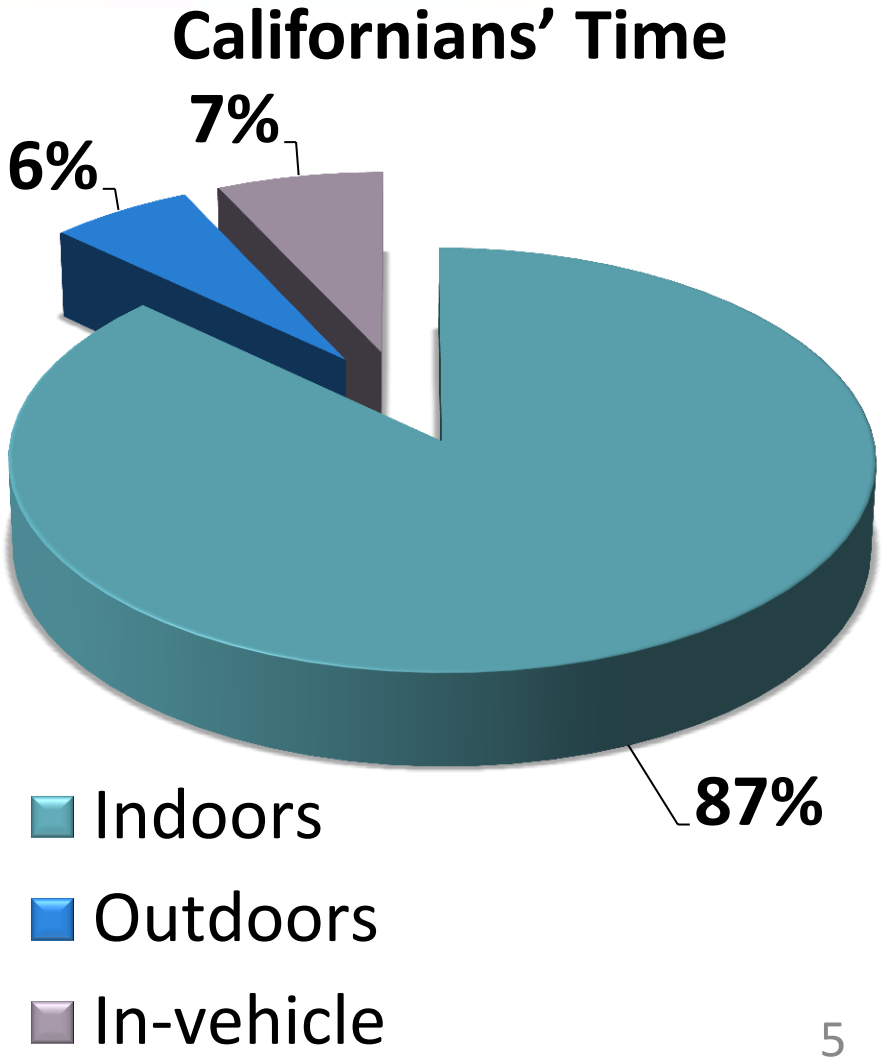
Schools, New Homes, Air Cleaners

2010

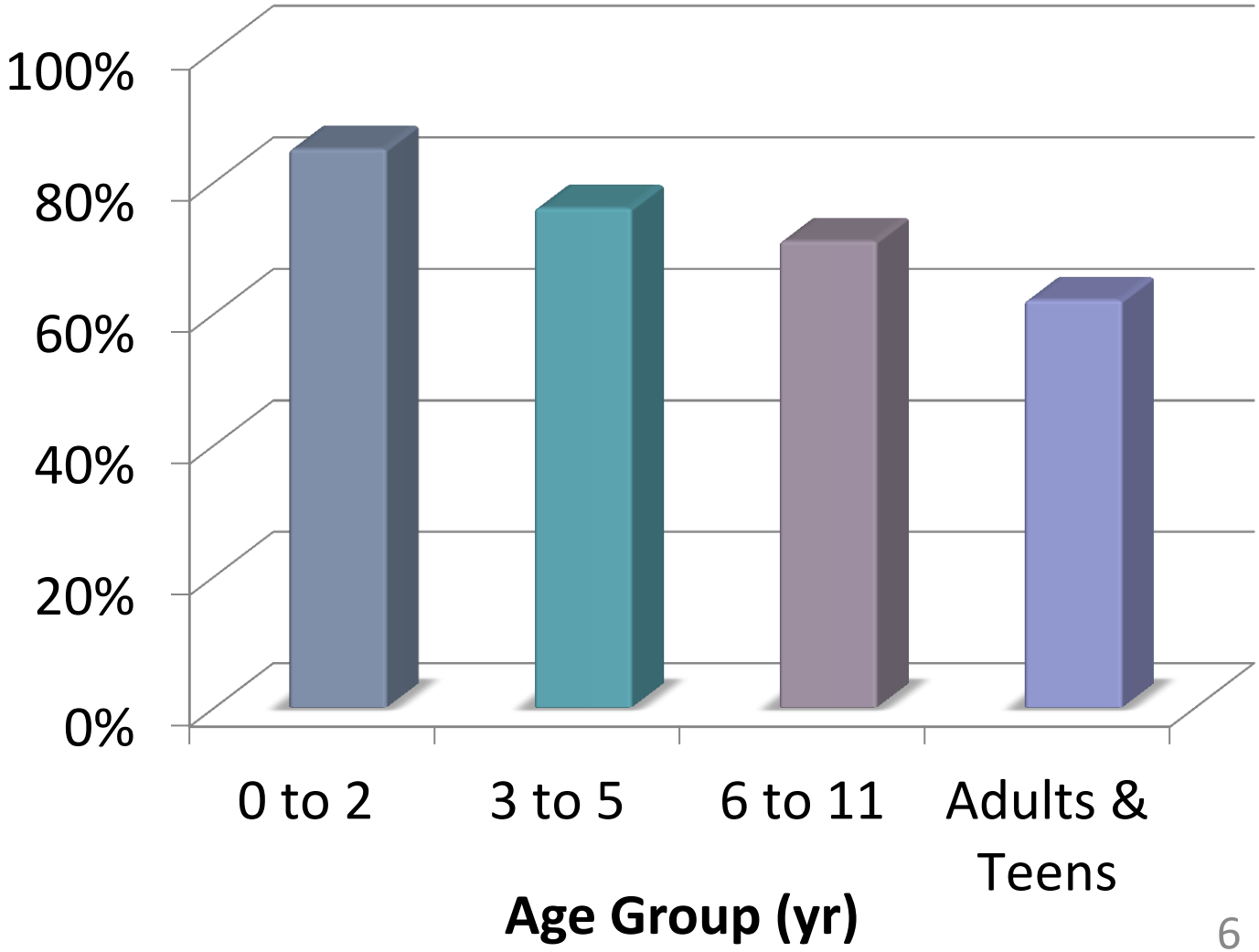
Daycare Centers, Ventilation & Filtration

The Indoor Environment

- Majority of time spent indoors
- Indoor sources include building materials and combustion appliances



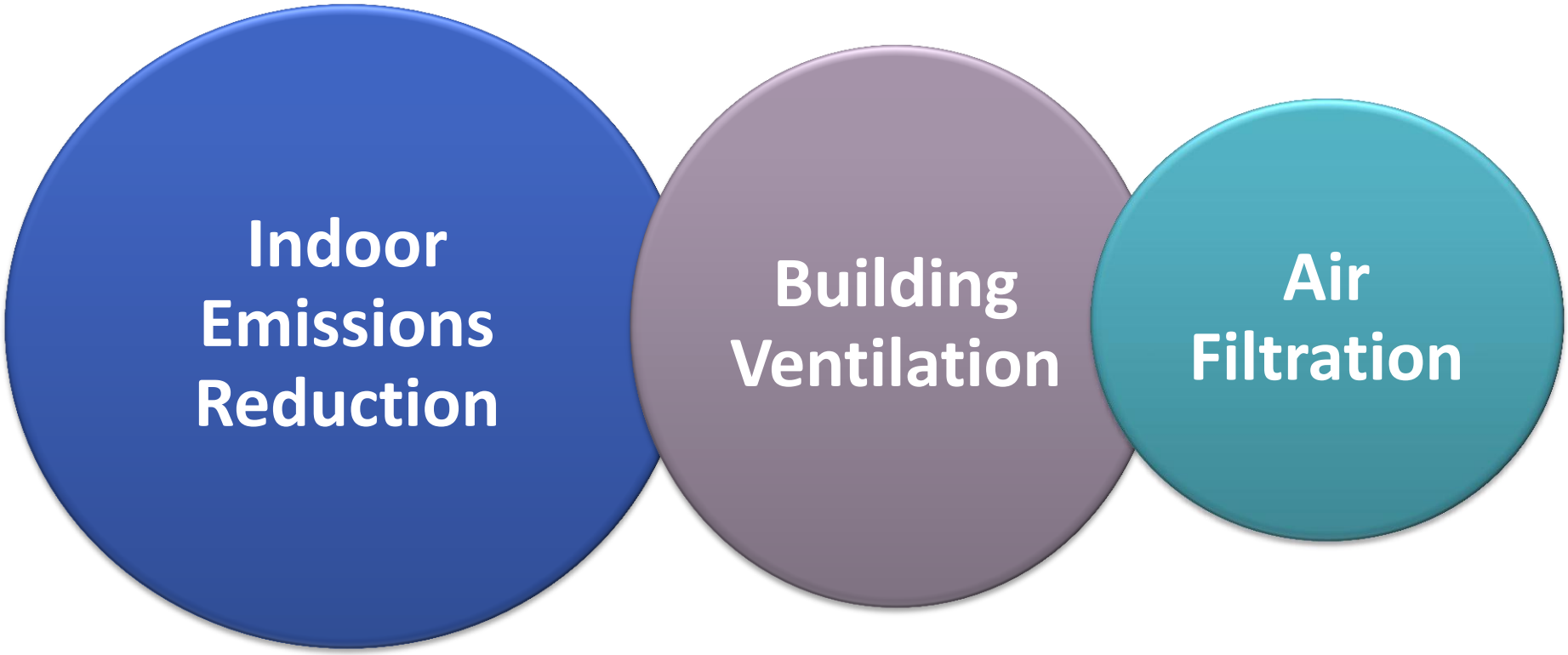
Home Indoor Environment Is Key for Children



Health Issues

- More asthma triggers
- Cancer risk
- Particulate pollution

Reducing Indoor Exposures



Program Highlights

Ozone-Generating Air Cleaners

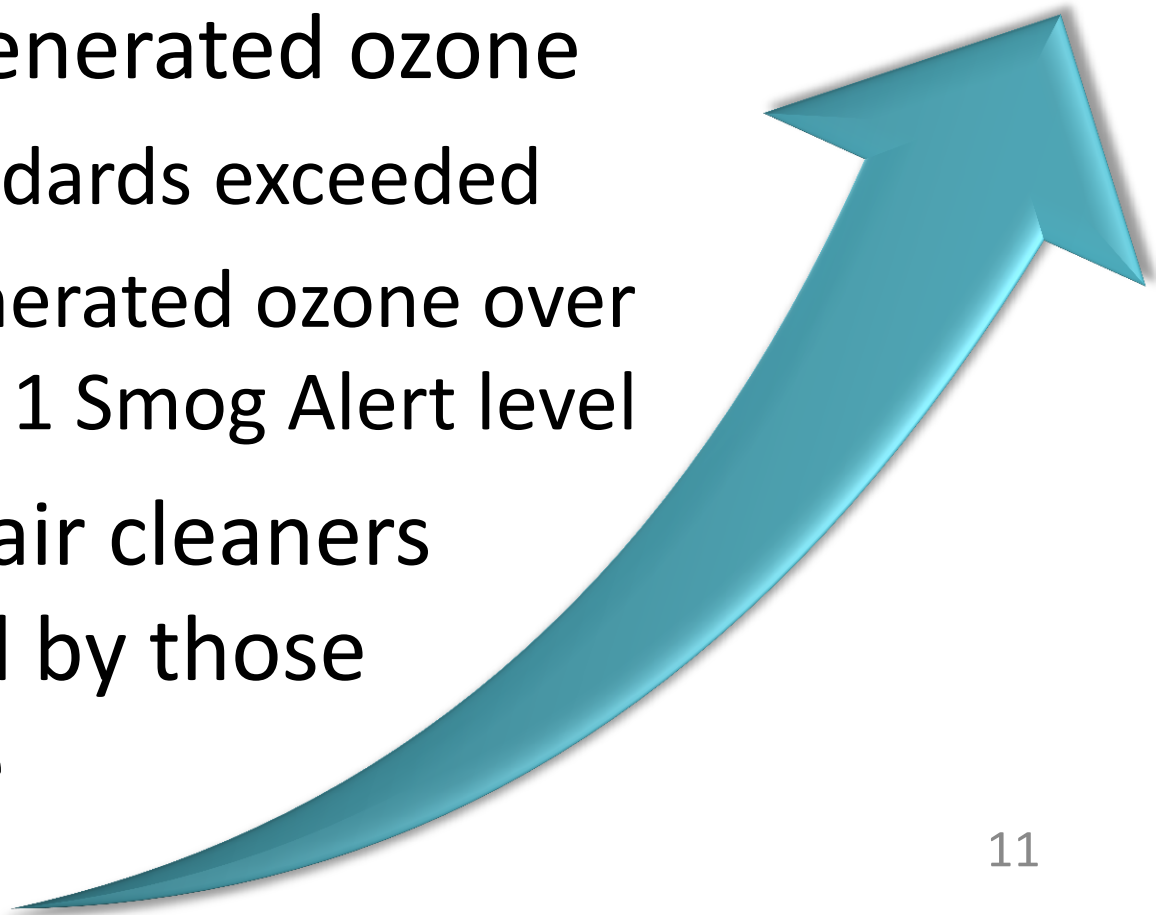
Formaldehyde Exposure

High Efficiency Filtration

Progress with Ozone-Generating Air Cleaners

Research Found High Ozone from Air "Cleaners"

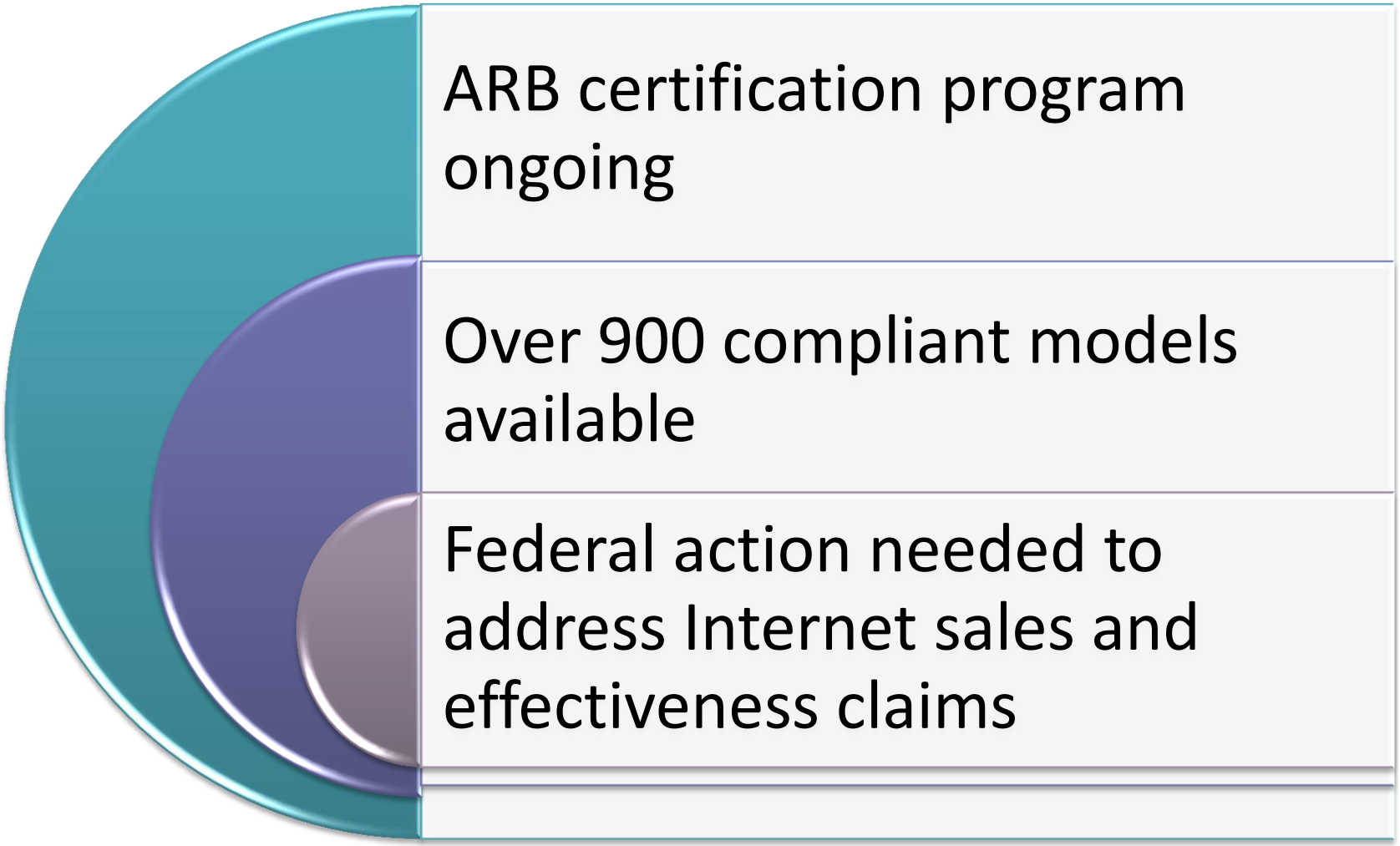
- ARB studies showed need for regulation
- Air "cleaners" generated ozone
  - Air quality standards exceeded
  - One model generated ozone over twice the Stage 1 Smog Alert level
- Survey showed air cleaners often purchased by those most vulnerable



2007 Board Action

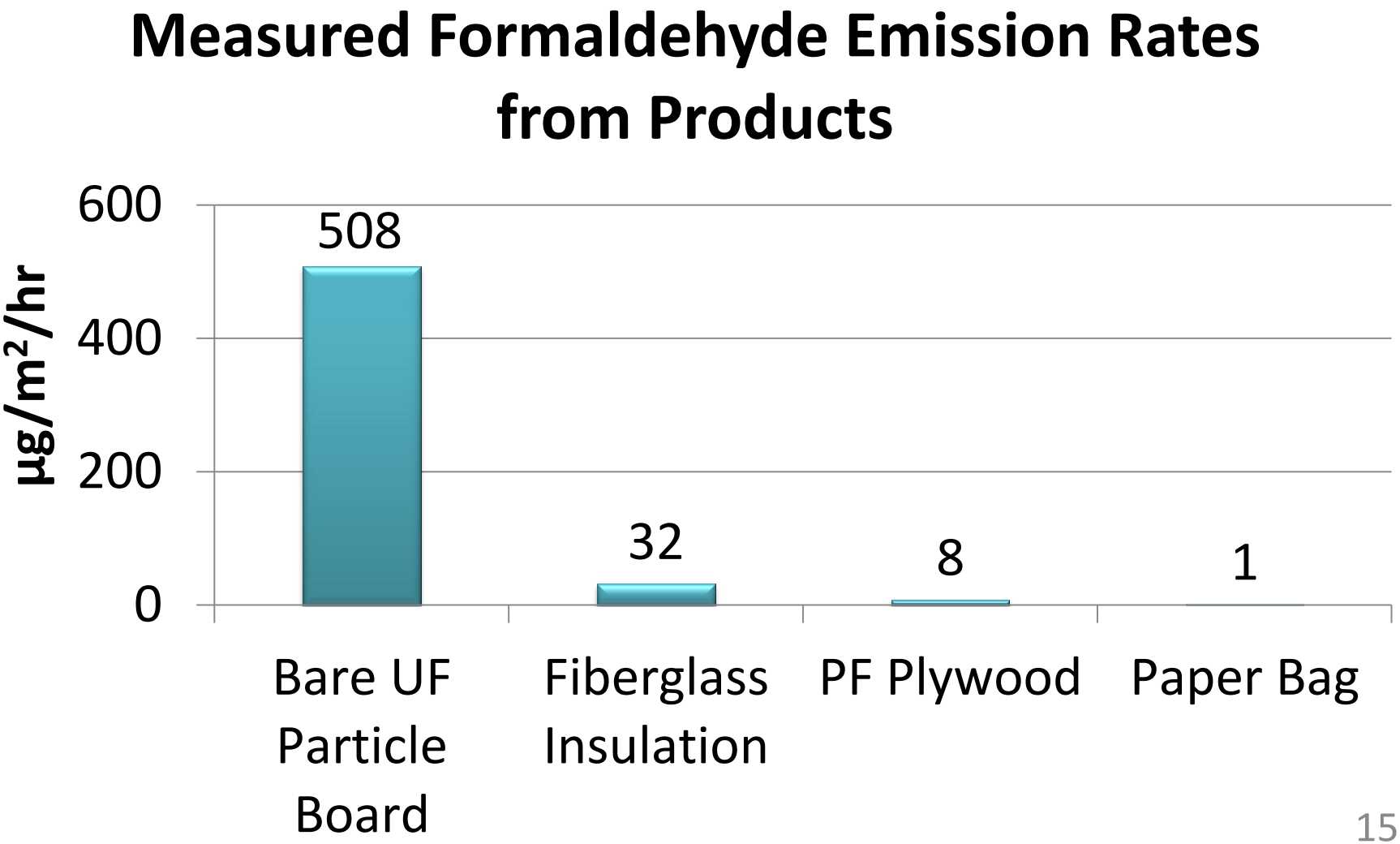
- AB 2276 gave ARB authority to limit ozone from indoor air cleaners
- ARB regulation requires:
  - Meet ozone concentration limit < 50 ppb
  - Certification & labeling

Progress in Implementation



Progress in Reducing Formaldehyde Exposure

ARB Study: High Formaldehyde Emissions Prompted ARB Action



Field Studies Found Elevated Formaldehyde

2004

Classrooms Study

- Formaldehyde
- Ventilation issues

2009

New Homes Study

- Formaldehyde
- Inadequate ventilation

2012

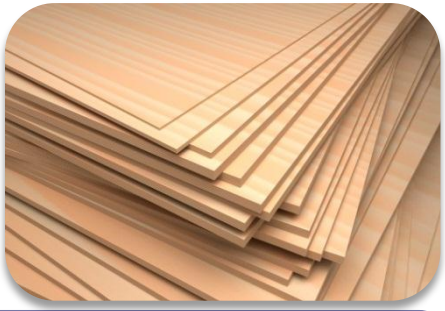
Daycare Centers Study

- Formaldehyde
- Other pollutants

ARB's Composite Wood Regulation

Limits formaldehyde emissions from:

- Hardwood plywood
- Particleboard
- Medium density fiberboard



ARB estimated 58% maximum reduction in formaldehyde concentration (Phase 2)

U.S. EPA's proposal aligns with ARB's emission limits

California's Green Building Standards

- Building Standards Commission & Housing and Community Development Department adopted standards
- CalGreen limits formaldehyde and other VOC emissions from:
  - Carpets
  - Vinyl flooring
  - Insulation
  - Other building materials

- Complements ARB's regulation

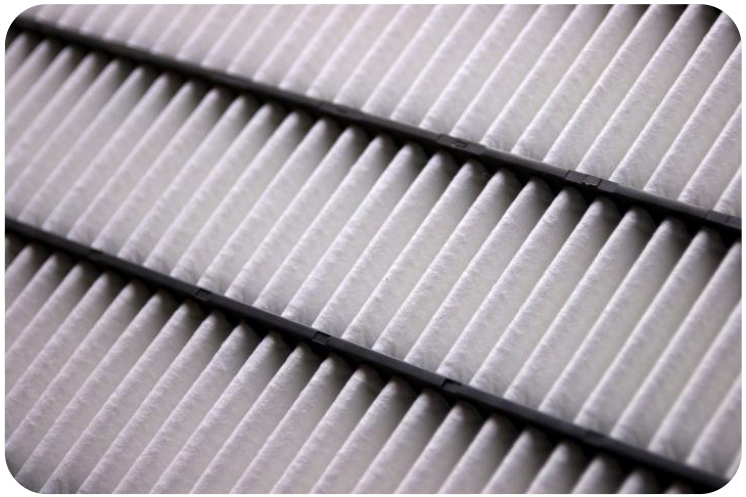
Mitigation Research: High Efficiency Filtration

Need to Reduce Indoor Exposure to Outdoor Pollutants

- Title 24 (Energy Code) requires whole-house mechanical ventilation to increase air exchange
  - Continuous exhaust systems most common
  - No filtration of incoming outdoor air required
- Possible mitigation strategy near high traffic areas and in high PM areas

Current ARB Filtration Studies

- Assess potential for high efficiency filtration to reduce indoor exposures
- Filtration with Mechanical Ventilation
  - Lawrence Berkeley National Laboratory
  - Completion: 2015
- Asthma and Exposure
  - University of California, Davis
  - Completion: 2016



LBNL Study of Filtration with Mechanical Ventilation

- Study to test 7 combined systems for:
  - Reduction of indoor exposure to outdoor pollutants
  - Energy efficiency
- Each combination to be tested across 2 seasons
- Measure indoor and outdoor PM2.5, ultrafine particles, ozone, VOCs, BC, & NO_2

Goal of LBNL Study

- Results expected to provide guidance for:
  - Title 24 amendments for new homes
  - State building codes for home retrofits

UCD Asthma and Exposure Study

How much does high efficiency filtration reduce indoor exposures to outdoor PM, and asthma symptoms?

Homes of 200 children with asthma, ages 6-12

Test central filtration & portable air cleaners

1 year intervention

Pollutant concentrations: PM0.2, PM2.5, PM10, BC, NO_2, O_3

Asthma measurements and symptom diaries

Goal of UCD Study

- Guidance on filtration improvements for existing homes that:
  - Reduce indoor exposures to indoor and outdoor PM
  - Reduce children's asthma symptoms

Summary

- ARB's research identified indoor air quality issues and solutions
- Public health benefits achieved through ARB regulations and actions by other agencies